REMARKS

Claims 1, 7-9, 11, 15, and 17 are cancelled by the foregoing amendments. Claims 2-4, 6, 10, 12, 14, 16, and 20-22 have been amended. Claims 23-27 are newly presented.

No new matter has been added by any of the amendments or new claims. Written support for any newly added features can be found in the specification and the drawings.

The Applicant hereby requests that the Examiner reconsider the various grounds of rejection set forth in the official action.

35 USC 102(a) and 102(e): Claims 1-5 and 7-21

The Examiner rejected Claims 1-5 and 7-21 under 35 USC 102(a) based on US Patent No. 6,533,991 (Moller I) and under 35 USC 102(e) based on US Patent No. 6,756,566 (Moller II). Moller I and Moller II describe and show cooling gas injection nozzles for vacuum heat treating furnaces. The cooling gas injection nozzles described and shown in Moller I and Moller II have identical features. The arguments relative to Moller I apply equally to Moller II. Therefore, remarks directed to the rejection based on the Moller cooling gas injection nozzle will be presented only once.

The Moller cooling gas injection nozzle (16) has a forward portion (21) and a rear portion (25). A first central opening (23) is formed through the length of the forward portion (21) and a second central opening (27) is formed through the length of the rear portion (25). The first central opening and the second central opening are aligned to form a continuous channel through the nozzle (16).

A flap (31) is disposed in the first central opening (23) and is pivotally supported therein by a pin (33). The pin traverses holes formed in the sidewalls (35a, 35b) of the forward portion (21). As shown in Figures 2 and 3 of Moller I, the pin (33) is located inward of the forward portion (21) near the point where the first central opening (23) meets the second central opening (27). The flap (31) is dimensioned so that it does not fit inside the first central opening (23) and actually extends outside the nozzle (16) in both the open and the closed positions. The first central opening (23) is at the outlet side of the nozzle (16) and the second central opening (25) is at the inlet side of the nozzle. The construction of the nozzles described and shown in Moller I and Moller II is necessary because the nozzles are located inside the hot zone of the vacuum heat treating furnace.

Gas injection nozzles that are installed in the interior of the hot zone are subject to physical damage and wear. The movable flap is adversely affected by repeated exposure to the high temperatures in the hot zone. Failure of individual nozzles adversely affects the operating efficiency of the vacuum heat treating furnace. For example, if the flap becomes stuck in the closed position, sufficient cooling gas may not reach the work load during the cooling cycle, thereby resulting in uneven cooling of the parts which causes distortion or undesirable properties. On the other hand, if the flap becomes stuck in the open position, significant heat can be lost during a heating cycle, thereby increasing the length of the heat treating cycle or possibly preventing the work load from reaching the desired heat treating temperature. The inboard nozzles can create significant down time, because the furnace and hot zone must be opened to access the broken or worn valve. Also, when the valves are arrayed radially about the interior of the hot zone, special measures must be implemented to maintain some of the valves in a closed position because the force of gravity tends to open them.

The Applicant's claimed check valve assembly as set forth in Claim 23 resolves these problems to a significant degree. The Applicant's claimed check valve assembly has a chamber formed in the inlet portion of the valve body. The flap is pivotally supported in the chamber such that it is adapted to swing inwardly toward the outlet portion of valve body. Thus, the flap in the Applicant's claimed check valve assembly is located at the inlet side of the valve. This arrangement is clearly different from the Moller nozzle which has the flap located at the outlet portion. This feature of the Applicant's claimed check valve assembly is advantageous because it permits the check valve assembly to be installed outside the hot zone where it is not subject to significant physical damage and wear.

The chamber in the Applicant's claimed check valve assembly encompasses the gas flow channel and has a recess formed therein into which the flap moves as it opens. When in the open position, the flap is located substantially within the recess so as to provide a substantially unobstructed gas flow path through the channel. This feature of the Applicant's claimed check valve assembly is also advantageous because it significantly reduces turbulence in the cooling gas as it flows through the check valve which would otherwise adversely limit the volume and velocity of the cooling gas flowing through the valve. Unobstructed delivery of the cooling gas to the hot zone provides enhanced cooling efficiency.

In view of the foregoing discussion, it should now be clear that the Applicant's claimed check valve assembly as set forth in Claim 23 is novel relative to the gas injection nozzle described and shown in the Moller I and Moller II. Moreover, there does not appear to be any suggestion in either Moller I or Moller II to modify that gas injection nozzle to have all the features of the Applicant's claimed check valve assembly. Accordingly, the Applicant's claimed check valve assembly would not have been obvious relative to the gas

injection nozzle described in Moller I and Moller II.

Claims 2-6 and new Claim 26, depend from Claim 23 either directly or indirectly. Therefore, the subject matter of those claims is patentable over the gas injection nozzle of Moller I and Moller II for at least the same reasons as Claim 23.

Claim 10 is directed to a vacuum heat treating furnace that comprises, among other features, "a plurality of check valves connected to the gas injection nozzles externally of the hot zone . . ." In Moller I and Moller II the gas injection nozzles with the flap valves are all located inside the hot zone of the vacuum heat treating furnace. See, Figures 1 and 3 of Moller I and Figures 1 and 4 of Moller II. Thus, neither Moller I nor Moller II describe or show a vacuum heat treating furnace having all of the features of Claim 10.

Moreover, each of the plurality of check valves in the vacuum heat treating furnace set forth in Claim 10 has the following features.

i. a valve body having an inlet portion, an outlet portion, and a channel that extends through the valve body between the inlet portion and the outlet portion;
ii. a chamber formed in the inlet portion of said valve body, said chamber encompassing the channel and having a recess formed therein adjacent to said channel; and
iii. a flap that is pivotally supported in said chamber such that said flap is adapted to swing toward the outlet portion of said valve body, said flap having a closed position whereby the channel is closed to the flow of cooling gas and an open position whereby the channel is open to the flow of cooling gas and said flap is located substantially within the recess in said chamber.

As discussed above relative to Claim 23, that combination of features is not described or suggested in either Moller I or Moller II.

For all the foregoing reasons, it should now be clear that the subject matter of Claim 10 is novel relative to the vacuum heat treating furnaces

described in Moller I and Moller II. Also, there does not appear to be any suggestion in either Moller I or Moller II to modify that vacuum heat treating furnaces, or the gas injection nozzles used therein, to have all the features of the Applicant's claimed vacuum heat treating furnace. Accordingly, the Applicant's claimed vacuum heat treating furnace would not have been obvious relative to the vacuum heat treating furnaces described in Moller I and Moller II.

Claims 12-14, 24, and 25 depend from Claim 10 either directly or indirectly. Therefore, those claims are allowable over Moller I and Moller II for at least the same reasons as Claim 10.

Claim 16 is directed to a hot zone for use in a vacuum heat treating furnace that comprises, among other features, "a plurality of check valves connected to the gas injection nozzles externally of the closed wall . . ." In Moller I and Moller II the gas injection nozzles with the flap valves are all located inside the hot zone of the vacuum heat treating furnace. See, Figures 1 and 3 of Moller I and Figures 1 and 4 of Moller II. Thus, neither Moller I nor Moller II describe or show a hot zone for a vacuum heat treating furnace having all of the features of Claim 16.

Moreover, each of the plurality of check valves in the hot zone set forth in Claim 16 has the following features.

i. a valve body having an inlet portion, an outlet portion, and a channel that extends through the valve body between the inlet portion and the outlet portion;
ii. a chamber formed in the inlet portion of said valve body, said chamber encompassing the channel and having a recess formed therein adjacent to said channel; and
iii. a flap that is pivotally supported in said chamber such that said flap is adapted to swing toward the outlet portion of said valve body, said flap having a closed position whereby the channel is closed to the flow of cooling gas and an open position whereby the channel is open to the flow of cooling gas and said flap is located substantially within the recess in said chamber.

As discussed above relative to Claim 23, that combination of features is not described or suggested in either Moller I or Moller II.

For all the foregoing reasons, it should now be clear that the subject matter of Claim 16 is novel relative to the hot zones described in Moller I and Moller II. Also, there does not appear to be any suggestion in either Moller I or Moller II to modify those hot zones, or the gas injection nozzles used therein, to have all the features of the Applicant's claimed hot zone. Accordingly, the Applicant's claimed hot zone would not have been obvious relative to the hot zones described in Moller I and Moller II.

Claims 18-21, 27, and 28 depend from Claim 16 either directly or indirectly. Therefore, those claims are allowable over Moller I and Moller II for at least the same reasons as Claim 16.

35 USC 103(a): Claims 6 and 22

The Examiner rejected Claims 6 and 22 under 35 USC 103(a) as being unpatentable over Moller I or Moller II. In making the rejection, the Examiner asserted that it would have been obvious to modify the dimensions of the flaps used in the gas injection nozzles of Moller I and Moller II.

Although the basis for the rejection of Claims 6 and 22 is questionable, the rejection is believed to be moot. Claim 6 depends from Claim 23 and thus, includes all of the features set forth in that claim. As discussed above, neither Moller I nor Moller II describe or suggest the combination of features set forth in Claim 23. Claim 22 depends from Claim 16 and thus, includes all the features of the hot zone set forth in that claim. As discussed above, neither Moller I nor Moller II describe or suggest the combination of features set forth in Claim 16. Therefore, Claims 6 and 22 are allowable over Moller I and Moller II for at least the same reasons as Claims 23 and 16, respectively.

CONCLUSION

In view of the foregoing amendments and remarks, it is believed that Claims 2-6, 10, 12-14, 16, and 18-28 are in condition for allowance. The Applicant respectfully requests that the Examiner reconsider the rejections of the claims and allow this application.

Respectfully submitted,

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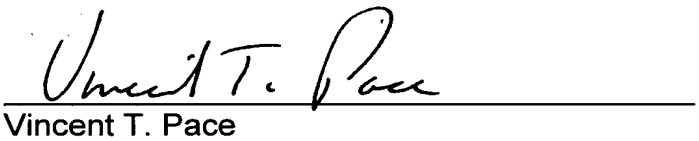

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